DEC STD 045-1 Packaging Products for International Shipment - Design Requirements and Procedures

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ABSTRACT: This document contains mandatory design requirements for packaging used to protect finished goods intended to be internationally shipped to customers. It also includes an appendix that specifies the dimensions of transport vehicles and handling devices used by Digital for the international distribution of packaged products.

APPLICABILITY: The requirements of this document are mandatory for all engineers responsible for the design and development of packaging used for the international distribution of Digital finished goods shipped to customers. It also applies to employees responsible for the physical movement of Digital products and/or personnel responsible for International Packaging contract suppliers.

STATUS: APPROVED 05-Sep-1990; type $ VTX SMC for expiration date.

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1 INTRODUCTION

This section of DEC STD 045 defines mandatory design requirements for the packaging of finished goods intended to be internationally shipped to customers. It also explains how to protect international shipments against rust and corrosion, the purpose and methods of preshipment testing, and how to package shipments in terms of standard vehicle sizes and handling devices.

1.1 PURPOSE

The purpose of this section of DEC STD 045 is to provide information for ensuring that package designs are adequate for intended use and will protect products throughout the international shipping environment.

A second objective of this section is to ensure product protection as a result of uniform, efficient, and economical packaging design.

1.2 RESPONSIBILITIES

The contents of this section are required for all engineers responsible for the design and development of packaging used for the international distribution of Digital customer products, as well as suppliers responsible for the contract crating of Digital products. Distribution purchasing shall provide this document to crating contractors as required.

2 PACKAGING METHODS

Packaging methods are classified according to the following levels:

Level 1	-	Heavy Duty
Level 1a	-	Crated (without water/vapor protection)
Level 2	-	Mid-range
Level 2a	-	Special Distribution
Level 3	-	Lightweight
Level 3a	-	Homogeneous

These levels are designed to protect products from deterioration and physical damage during various modes of transport, handling, and climatic conditions throughout the world.

The use of Levels 1, 1a, 2, and 3 for cabinets and peripherals on pallets is described in subhead 3. The use of Levels 1, 1a, 2, 2a, 3, and 3a for consolidation shipments is described in EL-MF425-00, *Procedures for Consolidating Packaged Products for Domestic and/or International Shipment.*

2.1 SELECTION

The customer's order may specify the packaging level. In the absence of specific customer requirements, the packaging level shall be selected from the selection tables in *DEC STD 045-0 Packaging Products for International Shipment - Introduction.*

3 PROTECTION LEVELS: CABINETS AND PALLETIZED PERIPHERALS

This heading describes each level of product protection in terms of package performance.

3.1 LEVEL 1 - HEAVY DUTY

The item shall be packaged for protection against the most severe climatic, transportation, handling, and storage conditions that may be encountered enroute to the final user. The criteria for using Level 1 packaging are as follows.

a. Multiple rough handlings during transport and in-transit storage from manufacturer to end user.

b. Repeated exposure to shock, vibration, dynamic and static loading during any mode of worldwide shipment. This includes shipment by air, ocean, and overland; manual loading and unloading; offshore discharge onto transport lighter; and primitive inland cartage to the final destination.

c. Any environmental exposure during transit, where port and warehouse facilities and mechanical handling devices are limited or non-existent.

d. Open storage such as roofed sheds with open sides, or, storage for extended periods of time in high-humidity zones (beyond three months).

3.1.1 Requirements

Items shall be fully packaged as for normal domestic distribution. Items shall then be wrapped and preserved as described in subhead 3.1.2, and assembled as described in subhead 3.1.5.

3.1.2 Water/Vaporproof Barriers (Flexible), Sealed and Preserved with Desiccant

Seal items in a water/vaporproof enclosure, conforming to MIL-B-131, *Water/Vaporproof Barrier Material, Class I*, along with an activated desiccant. Sufficient barrier material must be provided on the edge of the bag to permit opening and resealing the pack at least twice during use (usually for inspection).

Calculate the desiccant per subhead 4.2.6 and strategically position desiccant within the bag prior to evacuating air volume.

Draw a sufficient vacuum to cause the bag to cling snugly to the enclosed item. Ensure that an excessive amount of vacuum is not drawn, as this may puncture or rupture the barrier.

When wood-cleated plywood is used for an outer container, use a minimum of 90-lb kraft paper (or the equivalent) as an overwrap or as box liners to prevent chafing of the bag.

Packs with enclosures that stipulate water/vaporproofness shall meet the following requirements when subjected to leakage testing of barrier enclosure.

a. *Vacuum Retention Technique* - When the air in the sealed system has been evacuated to a constant specified pressure, allow the sealed system to remain undisturbed for 10 minutes. Note the pressure on the vacuum pressure gauge.

b. *Rejection* - A loss of vacuum from the sealed system shall not exceed 25% of the original vacuum after remaining undisturbed for 10 minutes.

3.1.3 Pallet Assembly (Figure 1)

a. Plywood deck -

1.6 cm (0.63 inch) thick for weights up to 682 kg (1500 lbs). Drill a minimum of five drain holes 1.6 cm (0.63 inch), uniformly spaced, and be careful to avoid stress areas.

b. Runner -

7.5 cm x 10 cm (3 inches x 4 inches actual).

c. Header -

5 cm x 5 cm (2 inch x 2 inch minimum).

NOTE

The length and width dimensions of a pallet must provide a minimum of 5 cm (2 inches) clearance between the walls of the inner and outer package on all sides. Do not add cushioning to the pallet base without first consulting the responsible Digital packaging engineer.

3.1.4 Panel Fabrication (Figure 1)

Assemble 0.95 cm (0.38 inch) plywood (CDX grade) and 2.5 cm x 10 cm [1 inch x 4 inch (0.75 inch x 3 inch minimum)] cleats, grades #3 or #4, using cement-coated or galvanized/zinc coated nails or staples, clinched on the backside. For loads over 454 kg (1000 lb), use 1.25 cm (0.5 inch) plywood.

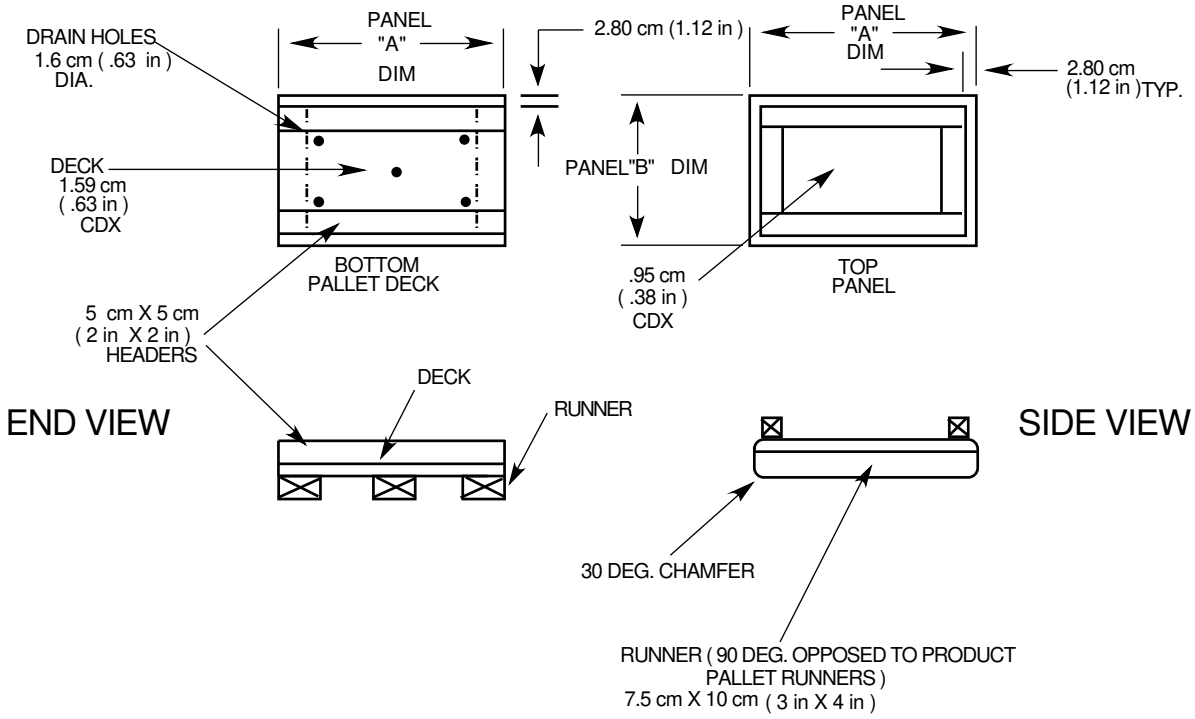
Intermediate cleat requirements for panels are as follows.

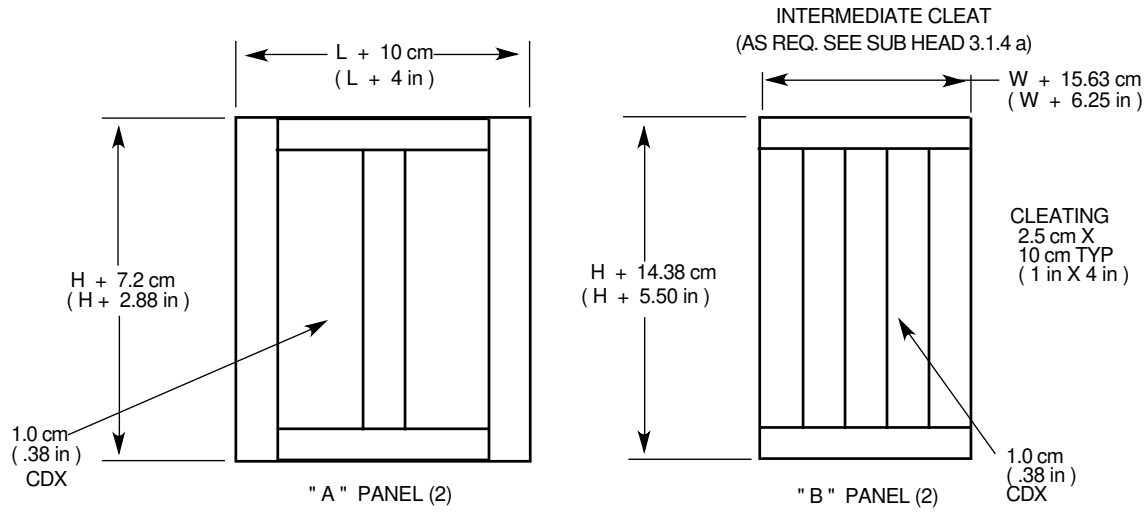
a. When one or both dimensions of a panel measured between the inside edges of edge cleats (unframed area) exceeds 60 cm (24.0 inches), one or more intermediate cleats of the same width and thickness as the edge cleats shall be applied perpendicular to the greater of the two dimensions between the edge cleats.

b. When both dimensions of a panel (unframed area) exceed 60 cm (24 inches) and are approximately the same dimensions, the intermediate cleat(s) shall be perpendicular to the filler edge cleats on the ends, top, and bottom, and perpendicular to the through edge cleats on the sides.

   Regardless of panel size, intermediate cleats are not required perpendicular to the required intermediate cleats unless their purpose is for splicing two pieces of plywood panels larger than 180 cm x 120 cm (72 inches x 48 inches).

Figure 1: Pallet Assembly and Panel Fabrication




INTERMEDIATE CLEAT
(AS REQ. SEE SUB HEAD 3.1.4 a)
L + 10 cm
(L + 4 in)
W + 15.63 cm
(W + 6.25 in)
H + 7.2 cm
(H + 2.88 in)
H + 14.38 cm
(H + 5.50 in)
CLEATING
2.5 cm X
10 cm TYP
(1 in X 4 in)
1.0 cm
(.38 in)
CDX
" A " PANEL (2)
" B " PANEL (2)
1.0 cm
(.38 in)
CDX

LEGEND:

L = DEC PACKAGE LENGTH
W = DEC PACKAGE WIDTH
H = DEC PACKAGE HEIGHT

ALL CLEATING NAILED AND CLINCHED WITH 4d NAILS

PALLET DECK AND RUNNERS ASSEMBLED WITH 10d CEMENT COATED NAILS

ALL LUMBER DIMENSIONS ARE NOMINAL

3.1.5 Package Assembly Procedure

1. Place single face corrugated sheet (or 90 lb kraft paper), corrugated side up, over pallet deck.
2. Cut and place barrier material (MIL-B-131, Class I) over sheet.
3. Cut and place single face corrugated sheet (or 90 lb kraft paper), corrugated side down, over barrier sheet.
4. Position domestic package on pallet (domestic package may already be on an integral pallet).
5. Peen all corners: Reduce sharp corners on wood skids, cartons, and other packaging. Prewrap or cushion as necessary to prevent damage to the bag or covering from projections, sharp corners, or edges.
6. Pull barrier over unit and heat-seal edges (in accordance with MIL-B-131) leaving one edge open. The minimum width of the seal is 2.5 cm (1 inch).
7. Strategically place desiccant, as required (see subhead 4.2).
8. Seal final edge of barrier material to point of air evacuation.
9. Evacuate air. Sufficient air has been evacuated when a minimum of 2.5 cm (1 inch) of barrier material can be pulled away from product. Heat-seal final opening before removing air evacuation nozzle.
10. Draw together excess material and secure with tape.
11. Overwrap with a minimum of 90 lb kraft paper (or equivalent) to prevent chafing.
12. Block and brace the intermediate pallet to the base (when applicable), and strategically place and secure a 5 cm (2 inch) buffer material (foamed plastic or a similar material) between the packaged unit and inside walls of the crate.
13. Assemble panels to pallet per Figure 2, using 10d cement-coated nails, 7.5 cm (3 inches) on center. Refer to U.S. Federal Specification PPP-B-601, *Boxes, Wood, Cleated-Plywood* for position and size.

Alternate assembly: Assemble panels to pallet per Figure 2, using .48 cm (.188 inch) diameter bolts with pronged tee nut. Maximum spacing between bolts: 25 cm (10 inches).

3.2 LEVEL 1A - CRATED (WITHOUT WATER/VAPOR PROTECTION)

The item shall be packaged for protection against the most severe transportation and handling conditions that may be encountered enroute to the final user. Criteria for using Level 1A packaging are as follows.

a. Multiple rough handlings during transport from manufacturer to end user

b. Repeated exposure to shock, vibration, dynamic, and static loading during any mode of worldwide shipment including air, ocean, and overland; manual loading and unloading; offshore discharge onto transport lighter; and primitive inland cartage to the final destination

c. Where mechanical handling devices are limited or non-existent

3.2.1 Requirements

Items shall be fully packaged as for normal domestic distribution. Items shall be overpacked as described in subhead 3.2.4.

3.2.2 Pallet Assembly

Assemble pallet as described in subhead 3.1.3, and shown in Figure 1.

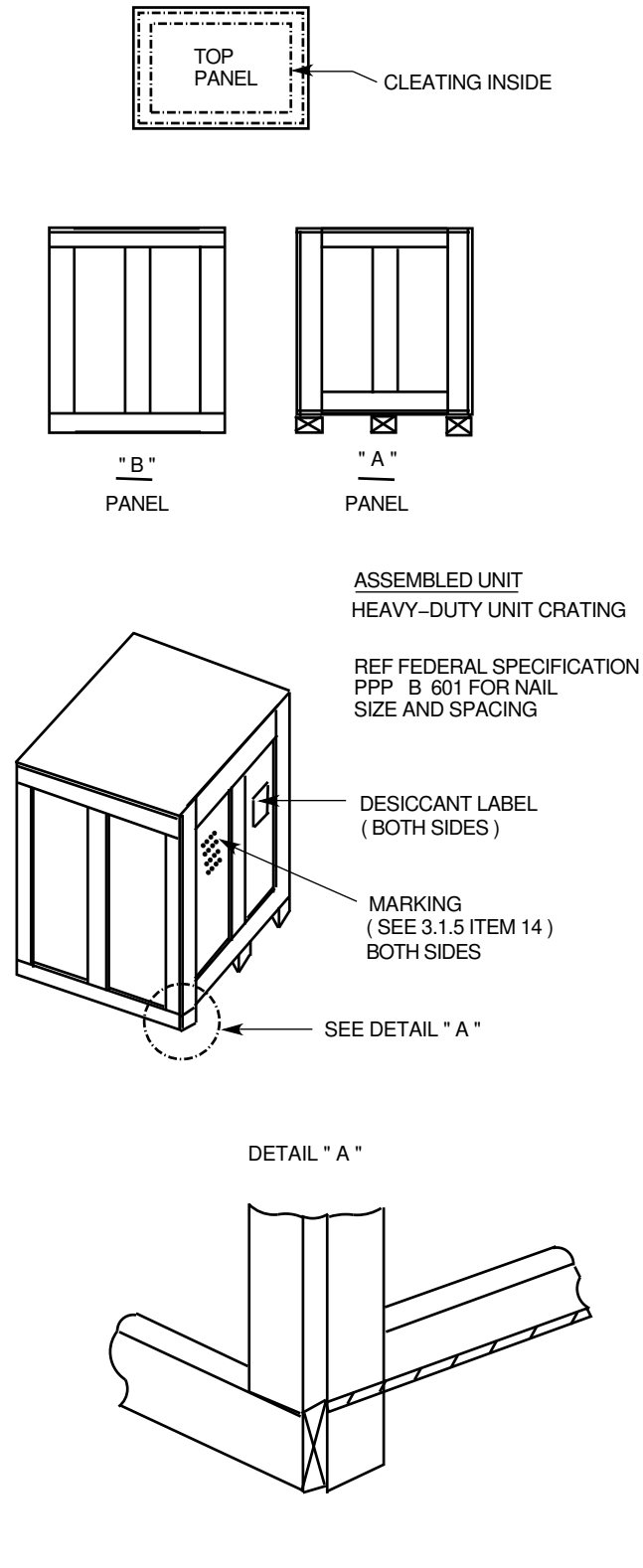
3.2.3 Panel Fabrication

Fabricate panel as described in subhead 3.1.4, and shown in Figure 1.

3.2.4 Package Assembly Procedure

1. Position domestic package on pallet (domestic package may or may not already be on an integral pallet).
2. Block and brace the intermediate pallet to the base (when applicable), and strategically place and secure a 5-cm (2-inch) buffer material (foamed plastic or similar material) between the packaged unit and the inside walls of the crate.
3. Assemble panels to pallet per Figure 2, using 10d cement-coated nails, 7.5 cm (3 inches) on center. Refer to U.S. Federal Specification PPP-B-601, *Boxes, Wood, Cleated-Plywood* for position and size.
4. Alternate assembly: Assemble panels to pallet per Figure 2, using .48 cm (.188 inch) diameter bolts with pronged tee nuts. Maximum spacing between bolts: 25 cm (10 inches).

Figure 2: Cleated Plywood Crate Assembly



3.3 LEVEL 2 - MID-RANGE

Packaging is required to protect product from physical damage, limited environmental hazards, and climatic changes during normal international shipping and handling.

Criteria for using Level 2 packaging are as follows.

a. Multiple handling during transportation and in-transit storage

b. Limited mechanical handling devices

c. Shock, vibration, and static loading of shipment worldwide by rail, truck, aircraft, or containerized ocean transport

d. Limited environmental exposure during shipment and in-transit transfers - - no requirements for offshore cargo discharge

e. Under covered storage for up to three months

3.3.1 Requirements for Palletized Products Packaged at the Point of Manufacture (Digital or Supplier)

Product shall be covered with an antistatic polyethylene shroud or loose fitting bag. The shipping container shall be fabricated of weather-resistant triple-wall corrugated fiberboard, 500 kg (1100 pound) minimum puncture-resistant, conforming to U.S. Federal Specification PPP-B-640, *Boxes, Fiberboard, Corrugated, Triple-wall.*

Cabinet containers using cap and sleeve construction may use caps fabricated from weather-resistant double-wall corrugated fiberboard, 272 kg (600 pound) minimum puncture-resistant, conforming to U.S. Federal Specification PPP-B-636, *Fiberboard.*

Two adjacent panels shall be marked "This package meets DEC STD 045 Level 2 requirements" in four languages per A-PS-9900045-GS-0, *General Specification for Standard Packaging Artwork*, Figure 180.

Container styles are as follows.

Style A: Cabinets over 105 cm (42 inches) high. Refer to Figure 3.

a. Two-piece fiberboard sleeve with cap. Use domestic pallet as specified on product Bill of Materials (BOM).

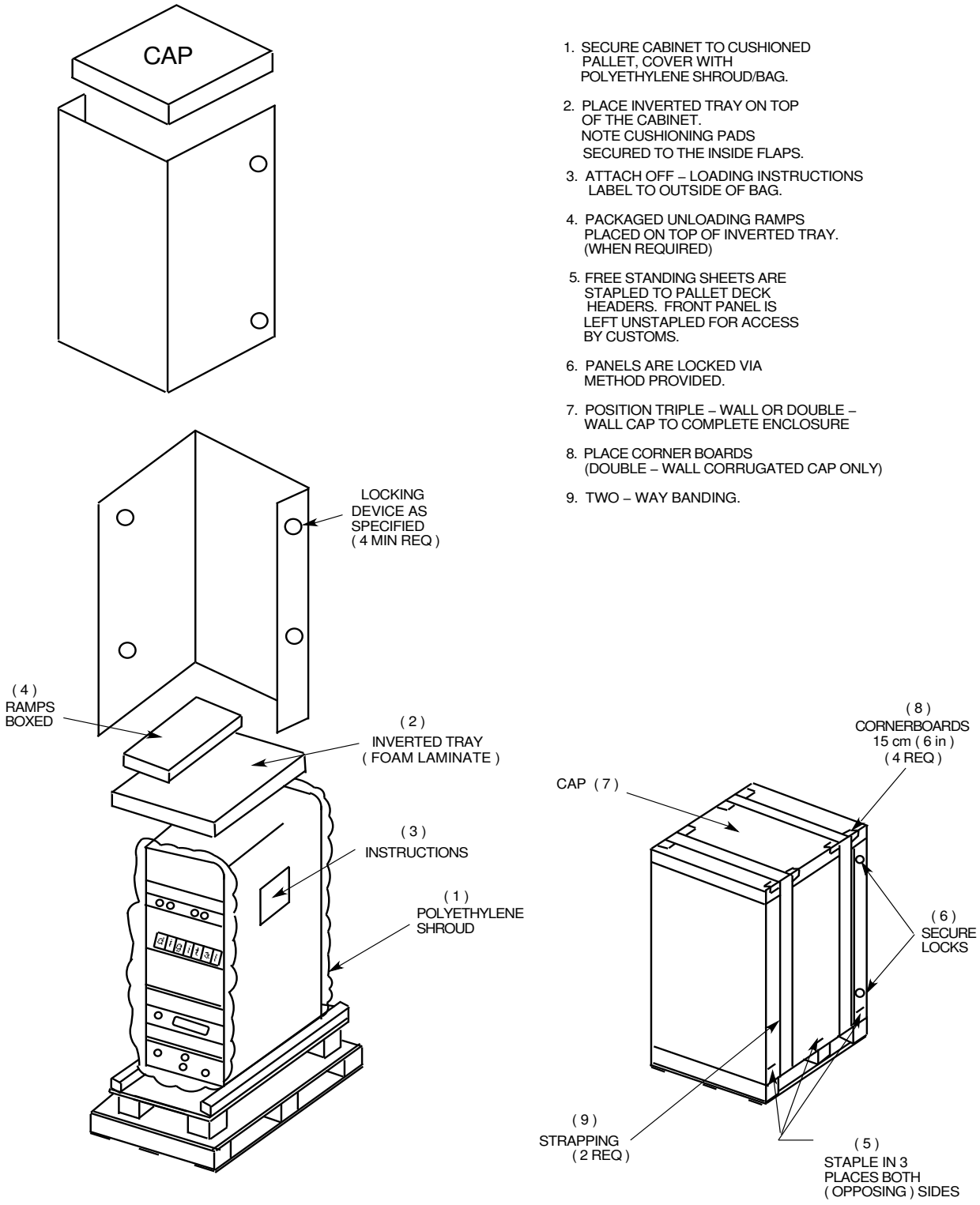
b. Overlap of sleeve joint: 25 cm (10) inches minimum.

c. Clearance between product cabinet and fiberboard sleeves: 5.0 cm (2 inches) minimum.

d. Strategically position and secure a 5 cm (2 inch) buffer material between the product cabinet and the inside walls of the fiberboard sleeves.

e. Secure opposed vertical joints with at least two mechanical fasteners per joint, spaced no greater than 60 cm (24 inches) from the top, bottom, or apart from each other.

Figure 3: Style A Triple-wall Pack, Assembled at Manufacturer's Site [Cabinets over 105 cm (42 inches) high]


CAP
1. SECURE CABINET TO CUSHIONED PALLET, COVER WITH POLYETHYLENE SHROUD/BAG.
2. PLACE INVERTED TRAY ON TOP OF THE CABINET. NOTE CUSHIONING PADS SECURED TO THE INSIDE FLAPS.
3. ATTACH OFF – LOADING INSTRUCTIONS LABEL TO OUTSIDE OF BAG.
4. PACKAGED UNLOADING RAMPS PLACED ON TOP OF INVERTED TRAY. (WHEN REQUIRED)
5. FREE STANDING SHEETS ARE STAPLED TO PALLET DECK HEADERS. FRONT PANEL IS LEFT UNSTAPLED FOR ACCESS BY CUSTOMS.
6. PANELS ARE LOCKED VIA METHOD PROVIDED.
7. POSITION TRIPLE – WALL OR DOUBLE – WALL CAP TO COMPLETE ENCLOSURE
8. PLACE CORNER BOARDS (DOUBLE – WALL CORRUGATED CAP ONLY)
9. TWO – WAY BANDING.
LOCKING DEVICE AS SPECIFIED (4 MIN REQ)
(4) RAMPS BOXED
(2) INVERTED TRAY (FOAM LAMINATE)
(3) INSTRUCTIONS
(1) POLYETHYLENE SHROUD
(8) CORNERBOARDS 15 cm (6 in) (4 REQ)
CAP (7)
(6) SECURE LOCKS
(9) STRAPPING (2 REQ)
(5) STAPLE IN 3 PLACES BOTH (OPPOSING) SIDES

Style B: Cabinets 105 cm (42 inches) high or less. Refer to Figure 4.

a. One-piece fiberboard sleeve with cap or half-slotted carton (HSC).

   1. Crush the body joint flap and the overlapped portion of the sleeve body prior to stitching.
   2. Stitch a body joint flap not less than 5 cm (2 inches) wide. The sleeve may be constructed from two sheets of triple-wall corrugated fiberboard only when the board manufacturer's machinery is incapable of producing sheets of a size suitable for single sheet construction. When two-piece construction is used, diagonally oppose the two body joints.
   3. Place metal staples on an approximate 45 degree angle across the strip and not more than 2.5 cm (1 inch) apart—the 2.5 cm (1 inch) measurement shall be from the lower tip of one staple to the top tip of the staple located directly below.

      Place the first and last staple 1.3 cm (0.5 inch) from the end of the flap. The wire for staples (preformed or machine stitched) shall be flat, minimum size 0.258 cm wide x 0.005 cm thick (0.103 inch wide x 0.020 inch thick).

      The crown size of the staples or stitch shall be 1.3 cm ± 0.33 cm (0.5 inch ± 0.13 inch). The wire shall have a commercially applied coating or plating such as a zinc coat or copper wash.

b. The direction of the flutes shall be vertical in the sides and the ends of the sleeves. There shall be no surface breaks in the board of either the cap or sleeve when folded 180 degrees along the score line parallel to the flute direction and 90 degrees along the score line perpendicular to the flute direction in both "A" and "B" containers.

c. There shall be a minimum of 3.8 cm (1.5 inches) clearance between cabinet and sleeve. For fragile items, provide a minimum of 5.0 cm (2 inches) around the product if it might be damaged due to distortion of the container.

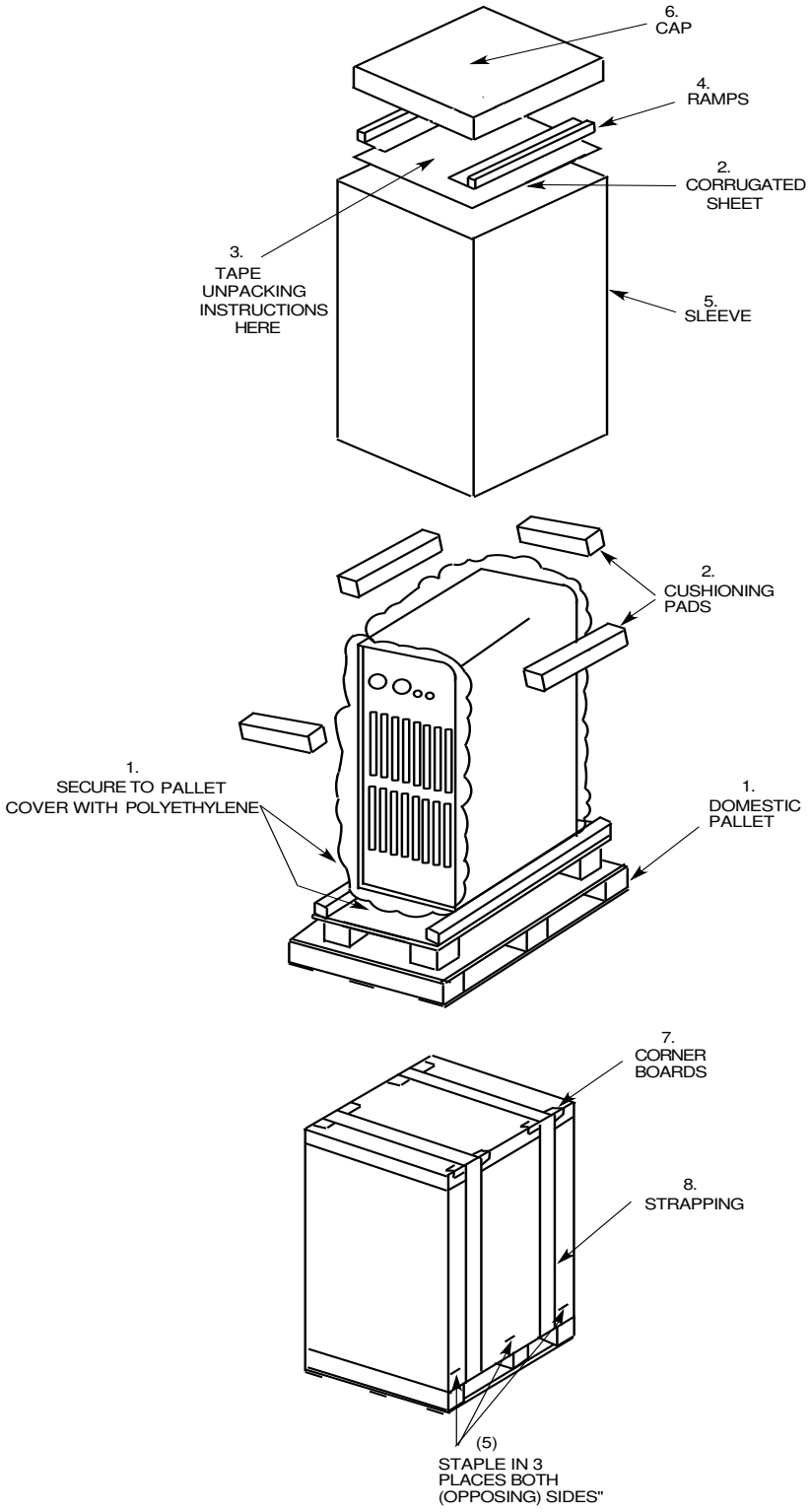
d. Use domestic pallet as specified on the product BOM.

e. Strategically position and secure buffer material between the product cabinet and the inside walls of the outer container.

NOTE

Interior corner posts or the like may be required to meet minimum compression requirements.

Figure 4: Style B Triple-wall Pack, Assembled at Manufacturer's Site [Cabinets 105 cm (42 inches)high or less]



1. SECURE CABINET TO CUSHIONED PALLET (AS SPECIFIED ON DOMESTIC PACK), COVER WITH POLYETHLENE SHROUD/BAG.
2. PLACE CORRUGATED SHEET ON TOP OF THE CABINET. SECURE CUSHIONING PADS (AS REQUIRED) AROUND PERIPHERY OF CABINET TOP TO FILL VOID BETWEEN CABINET AND CONTAINER.
3. ATTACH OFF–LOADING INSTRUCTIONS LABEL TO TOP OF CORRUGATED SHEET.
4. UNLOADING RAMPS PLACED ON TOP OF CORRUGATED SHEET. (WHEN REQUIRED)
5. SLEEVE (OR H.S.C) IS STAPLED TO PALLET (3.8 CM 1.5 IN CEMENT COATED STAPLES)
6. POSITION TRIPLE–WALL OR DOUBLE–WALL TO COMPLETE ENCLOSURE (WHEN REQUIRED).
7. PLACE CORNER BOARDS (DOUBLE–WALL CORRUGATED CAP ONLY).
8. TWO–WAY BANDING.

3.3.2 Upgrading to Level 2 - When Palletized Product is Prepacked Per Level 3

The packaged product shall be overpacked in a shipping container fabricated of weather-resistant triple-wall corrugated fiberboard, 500 kg (1100 pound) minimum puncture-resistant, conforming to U.S. Federal Specification PPP-B-640, *Boxes, Fiberboard, Corrugated, Triple-wall.*

Cabinet containers using cap and sleeve construction may use caps fabricated from weather-resistant double-wall corrugated fiberboard, 272 kg (600 pound) minimum puncture-resistant, conforming to U.S. Federal Specification PPP-B-636, *Fiberboard.*

Container styles are as follows.

Style A: Level 3 package over 127 cm (50.0 inches) high, including the pallet height. Refer to Figure 5.

a. Two-piece fiberboard sleeve with cap.

b. Overlap of the sleeve joint: 25 cm (10 inches) minimum.

c. Clearance between the inner pack and the outside container walls: 5 cm (2 inches) minimum.

d. Block and brace the intermediate pallet to the base (when applicable), and strategically place and secure a 5 cm (2 inch) buffer material (foamed plastic or equivalent) between the packaged unit and the inside walls of the outer container.

e. Secure opposed vertical joints with at least two mechanical fasteners per joint, spaced no greater than 60 cm (24 inches) from the top or bottom or apart from each other.

Style B: Level 3 package equal to or less than 127 cm (50 inches) high, including the pallet height. Refer to Figure 6.

a. One-piece fiberboard sleeve with cap or half-slotted carton (HSC). Container construction shall be as described under Style B in subhead 3.3.1.

b. Clearance between the inner pack and the outside container walls: 3.8 cm (1.5 inch) minimum.

c. Block and brace the intermediate pallet to the base (when applicable), and strategically place and secure a 3.8 cm (1.5 inch) buffer material (foamed plastic or equivalent) between the packaged unit and inside walls of the outer container.

NOTE

Interior corner posts or equivalent may be required to meet minimum top to bottom compression requirements.

Figure 5: Upgrading Level 3 Package to Level 2 - Package is Style A [over 127 cm (50 in) high, including pallet height]

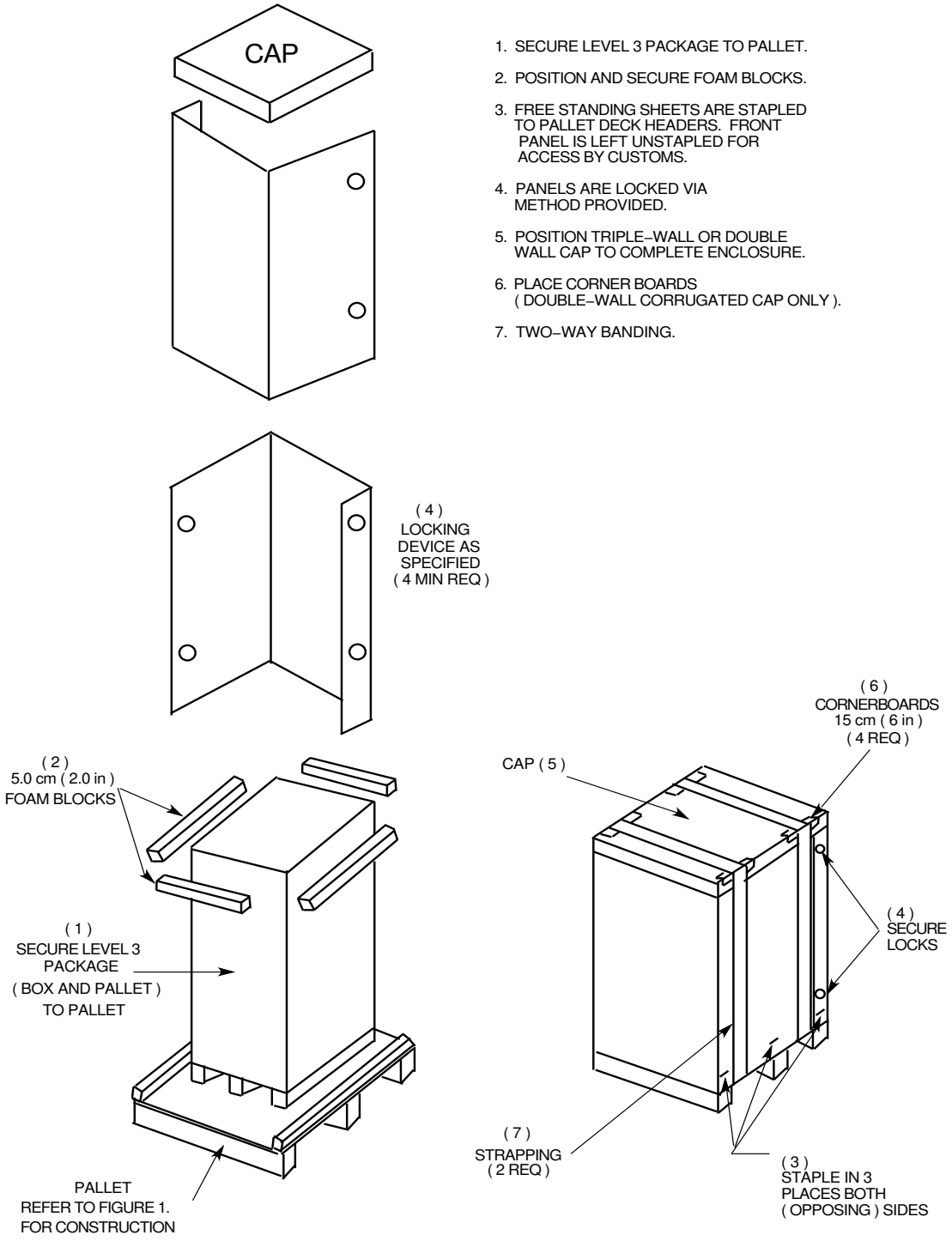
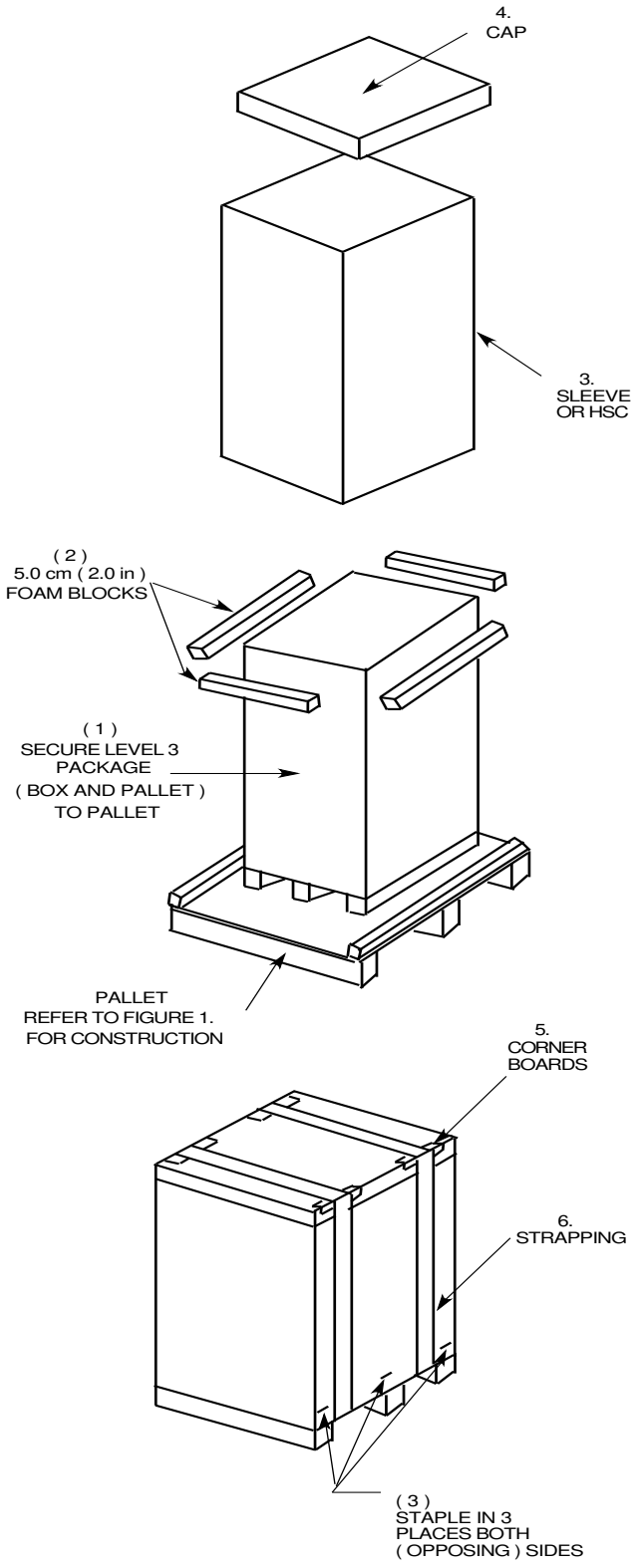

CAP
1. SECURE LEVEL 3 PACKAGE TO PALLET.
2. POSITION AND SECURE FOAM BLOCKS.
3. FREE STANDING SHEETS ARE STAPLED TO PALLET DECK HEADERS. FRONT PANEL IS LEFT UNSTAPLED FOR ACCESS BY CUSTOMS.
4. PANELS ARE LOCKED VIA METHOD PROVIDED.
5. POSITION TRIPLE–WALL OR DOUBLE WALL CAP TO COMPLETE ENCLOSURE.
6. PLACE CORNER BOARDS (DOUBLE–WALL CORRUGATED CAP ONLY).
7. TWO–WAY BANDING.
(4) LOCKING DEVICE AS SPECIFIED (4 MIN REQ)
(2) 5.0 cm (2.0 in) FOAM BLOCKS
(1) SECURE LEVEL 3 PACKAGE (BOX AND PALLET) TO PALLET
PALLET REFER TO FIGURE 1. FOR CONSTRUCTION
(6) CORNERBOARDS 15 cm (6 in) (4 REQ)
CAP (5)
(4) SECURE LOCKS
(7) STRAPPING (2 REQ)
(3) STAPLE IN 3 PLACES BOTH (OPPOSING) SIDES

Figure 6: Upgrading Level 3 Package to Level 2 - Package is Style B [equal to or less than 127 cm (50 in) high, including pallet height]



1. SECURE LEVEL 3 PACKAGE TO PALLET.
2. SECURE CUSHIONING PADS (AS REQUIRED) AROUND PERIPHERY OF CABINET TOP TO FILL VOID BETWEEN LEVEL 3 PACKAGE AND OUTSIDE WALLS.
3. SLEEVE (OR HSC) IS STAPLED TO PALLET (3.8 cm 1.5 in CEMENT COATED STAPLES).
4. POSITION TRIPLE–WALL (OR DOUBLE–WALL CAP TO COMPLETE ENCLOSURE (WHEN REQUIRED)
5. PLACE CORNER BOARDS. (DOUBLE–WALL CORRUGATED CAPS ONLY).
6. TWO–WAY BANDING.

3.4 LEVEL 3 - LIGHTWEIGHT

A Level 3 package must protect the product against physical damage where:

a. Specific knowledge is available about shipping conditions relative to handling, distance, and mode of transportation.

b. The estimated time from manufacture to the time of installation is 6 months or less.

Level 3 packaging must also meet the minimum requirements of the shipping rules and regulations in those countries where the product is known to be transported. To meet such requirements, the following criteria must be satisfied if Level 3 packaging is to be used.

a. Handling during transportation and in-transit storage is limited.

b. Normal mechanical handling devices are used to handle package.

c. Shock, vibration, and static loading during the transportation cycle are within expected domestic limits.

d. Package will be contained in a controlled warehouse environment under Digital supervision (up to three months).

e. Stacking and superimposed loads during shipment and storage are within the limits of domestic packaging design criteria.

3.5 OTHER PROTECTION LEVELS

Products other than cabinets and peripherals on pallets shall be unitized and/or consolidated in accordance with EL-MF425-00.

3.6 INTERPLANT PACKAGING

Minimum packaging requirements for interplant shipments are contained in *DEC STD 043-0 Packaging Requirements for Digital Products, Parts, Assemblies and Materials.*

3.7 MARKING AND LABELING

All marking and labeling shall be in accordance with *DEC STD 064-0 Compliance with International Language Requirements* and *DEC STD 178-4 Container Marking Requirements for Finished Goods.*

a. Marking
   - Country of origin (if not already preprinted on shipping container)
   - Cube (meters and feet)
   - International symbols per *DEC STD 178-5 Marking Symbology*
   - Special markings as may be required on customer order

b. Labeling
   - Shipping labels as required by *DEC STD 178-8 General Shipping Documentation and Container Labeling Requirements for Finished Goods Intended to be Shipped To Customers*
   - Desiccant label per Digital purchase specification A-PS-3622283-01, *Desiccant Label* (for use with Level 1 packages only)
   - Other labels as required by customer orders

4 RUST AND CORROSION CONTROL

Most bare (non-treated) metals corrode when the immediate environment contains moisture. The rate of corrosion is influenced by the manner in which the moisture contacts the material - - alternate wetting and drying (as created by a spray) cause rapid corrosion, and immersion (such as condensation of a thin layer of water) causes even more destruction.

Items can be protected from the harmful effects of high humidity by using one of the following two procedures.

a. Place a barrier "wall" (such as plating or chemical vapor) between the surface of the item and the surrounding atmosphere.

b. Control the atmosphere surrounding the surface of the item (Such as static dehumidification). Use this method when the use of a contact barrier is not possible or undesirable, and the item under consideration requires environmental protection.

4.1 VOLATILE CORROSION INHIBITORS (VCIs)

Some chemical vapors are known to inhibit corrosion and neutralize the effects of moisture-laden air within a package. These chemicals are referred to as volatile corrosion inhibitors (VCIs).

Items preserved with VCIs should be enclosed in sealed waterproof wraps or containers.

4.1.1 Restrictions and Limitations In The Use Of VCIs with Digital Products

VCI materials will not protect all metals from corrosion; in fact, VCIs appear to increase the rate of corrosion in certain metals.

Precautions must be taken when VCIs are used with assemblies, subassemblies, and other items containing zinc plate, cadmium, zinc-based alloys, magnesium-based alloys, lead-based alloys, and alloys of other metals, including solders and brazing alloys. If such items contain more than 30 percent of zinc or 9 percent of lead, they must not be packaged with VCI materials. In all cases, direct contact of VCIs with non-ferrous metals, except aluminum and aluminum-based alloys, should be avoided unless specific permission has been granted.

Care should also be taken with assemblies containing plastics, painted parts, or components of natural or synthetic rubber. Assemblies containing parts made of these materials should not be packaged with VCIs until the responsible design engineer has established that the materials are fully compatible with the VCI selected. VCIs should not be used in a desiccated package.

4.1.2 Application of Sheets and Rolls

Unless otherwise specified, VCI-treated materials must completely enclose the item, or the item may be wrapped with strips of VCI material provided other material is placed between the item and the VCI wrapping. Complete wrapping, where feasible, is preferred.

The treated face of VCI material must be placed toward the item being wrapped. The wraps should be applied in such a manner that air entering the package will pass through or over the surface of the VCI before reaching the item. VCI-treated materials should not be more than 30 cm (12 inches) away from the item surface to be protected.

4.1.3 Material in Tiers or Layers

When items are packaged in tiers or layers, the VCI should be placed between the tiers. When VCI-treated materials are used in a box containing separators, all faces of the separators must be lined with VCI-treated material, in addition to lining the inside of the box.

4.1.4 Amount of VCI Required

When used as a complete overwrap, the amount of VCI-treated barriers should equal at least 35 percent of the surface area of the enclosing container. When not used as an overwrap, the amount of VCI-treated material must be at least equal to the surface area of the enclosing container. Crystalline VCIs should equal 34 grams per cubic meter (1 gram per cubic foot) of the volume of the enclosing container.

4.1.5 Handling Precautions

Due to the fact that VCI materials may include ingredients that irritate the eyes and skin, the following note shall be included in each package that is protected with a VCI. The note must be printed or copied on a 4.25-inch x 5.5-inch sheet (minimum), in standard typewritten copy, in capital letters. For example:

NOTE

VCI MATERIALS MAY INCLUDE INGREDIENTS IRRITATING TO THE EYES AND SKIN OF SOME PEOPLE.

DO NOT RUB OR WIPE EYES WHILE HANDLING VCI-TREATED MATERIALS.

WASH HANDS THOROUGHLY WITH SOAP AND WATER AFTER HANDLING VCI-TREATED MATERIALS.

In addition, the above information must be conveyed to personnel responsible for the original packing of VCI-treated materials.

4.2 DESICCANT USE

Static dehumidification is generally accomplished by placing a drying agent (usually a desiccant) in the space to be dehumidified. This agent either absorbs or adsorbs water from the surrounding atmosphere.

Inasmuch as all such materials have a limit to their ability to take water from the atmosphere and hold it, a means must be provided for preventing a continuous supply of moisture-laden air or free water from reaching the area being dried by the drying agent. This function is served by sealed barrier wraps.

An effective barrier must have a water/vapor transmission rate of no more than 0.05 to 0.07 grams per 650 square cm (100 square inch) surface area over a 24 hour period. Sufficient desiccant to maintain an atmospheric range of 40 to 50 percent relative humidity is satisfactory for protecting most computer components from the effects of corrosion and microorganism growth.

4.2.1 Materials

Numerous materials are available as desiccants for moisture control. The most commonly used is silica gel.

4.2.2 Bag Size

Desiccants shall be furnished in bags in the fractional unit sizes of 1/6, 1/3, and 1/2; the unit size 1; and the multiple unit sizes of 2, 4, 8, 16, and 80, as specified.

A desiccant unit is the quantity of desiccant that in equilibrium at 25 degrees C adsorbs 3.0 grams of moisture at 20 percent relative humidity and 6.0 grams of moisture at 40 percent relative humidity. The approximate weight of a unit of silica gel desiccant is 25 grams (0.9 ounces).

4.2.3 Tie Strings

Unless otherwise specified in the contract or order, bags of 16-unit size or larger shall be provided with tie strings a minimum of 17.5 cm (7 inches) long.

4.2.4 Contamination

To minimize the possibility of damage from moisture-laden desiccant, the desiccant package should not be in contact with the product surface.

4.2.5 In-Process Handling

Due to the moisture-adsorbent properties of desiccant, the desiccant storage container must not be opened for any period longer than required for withdrawals. Withdrawals shall be limited to the quantity intended for immediate use, and the container shall be immediately and tightly resealed after withdrawal.

4.2.6 Desiccant Formula

Determining the proper amount of desiccant for a package is crucial to proper product protection and thus should never be estimated. To determine the units of desiccant to use within a Level 1 container, use the following formula.

U = KC

Where,

U = Number of units of desiccant to be used
K = 4.0 for shipments to the Peoples Republic of China
K = 2.3 for all other shipments
C = Cubic feet of prepackaged product to be protected, including pallet

For example:

Given a prepackaged product with the following dimensions:

44.0 inches long x 36.0 inches wide x 72.0 inches high

K = 4.0 (for People's Republic of China)
C = 66 cubic feet (44 x 36 x 72 = 114048 cubic inches, divided by 1728)

U = KC, therefore U = (66.0 x 4.0) = 264.0 *

* Add 10 percent to requirements when humidity in packaging area is 80 percent or greater.

Table 1: Typical Desiccant Bag and Unit Sizes

	Bag size	
Unit	centimeters	inches
1/6	7.5 x 7.5 x 0.63 cm	3.0 x 3.0 x 0.25 in.
1/3	7.5 x 8.2 x 0.63	3.0 x 3.25 x 0.25
1/2	10.0 x 7.5 x 0.63	4.0 x 3.0 x 0.25
1	12.5 x 8.75 x 0.63	5.0 x 3.5 x 0.25
2	11.25 x 12.5 x 1.25	4.5 x 5.0 x 0.5
4	13.75 x 11.25 x 1.25	5.5 x 4.5 x 0.5
8	18.75 x 7.5 x 3.75	7.5 x 3.0 x 1.5
16	22.5 x 10.0 x 5.0	9.0 x 4.0 x 2.0
80	37.5 x 21.25 x 6.25	15.0 x 8.5 x 2.5

5 PACKAGED PRODUCT TESTING

5.1 PRESHIPMENT TESTING

The purpose of preshipment testing is to identify the strengths and weaknesses of the packaged product when subjected to tests simulating the international distribution environment.

a. Packaged products must have successfully passed the requirements of DEC STD 102-0 in their respective domestic shipping containers prior to shipping Level 3 or upgrading to Level 1 or 2.

b. Packaged products shall be tested in the following sequence: vibration, drop, incline-impact (when applicable), and compression per the latest revision of *DEC STD 102-2 Environmental Standard for Computers and Peripherals - Mechanical Shock and Vibration Test Requirements.*

APPENDIX A STANDARD SIZES FOR TRANSPORT VEHICLES AND MECHANICAL HANDLING DEVICES

Digital ships via a number of transport modes, including air, overland, and ocean container. Each of these modes uses various size vehicles to move containerized shipments. There are also mechanical handling devices within the system for moving palletized loads to and from vehicles and storage. The most common are fork trucks and pallet jacks (hand pallet trucks).

A.1 STANDARD VEHICLE SIZES

A.1.1 OVERLAND TRAILERS

The three types of vehicles used by Digital in overland transport are common carrier, air-ride van, and king-size air-ride van.

NOTE

To assist in load planning and pallet/consolidation design, the inside dimensions of the most common U.S. sizes are shown in Figure A-1.

A.1.2 OCEAN CONTAINER VEHICLES

The most common sizes of door-to-door ocean containers are 12.4 meters (40 feet) long and 6.2 meters (20 feet) long.

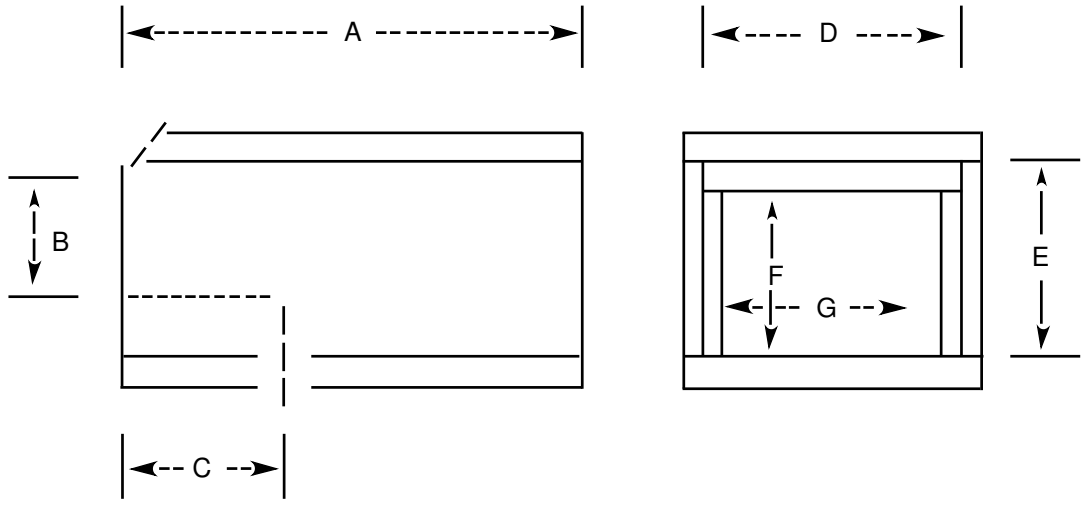
a. Ocean containers of the 12.4 meter class are divided into two types: A-40, standard dry cargo, and B-40, hi-cube dry cargo. The only difference between the two versions is height (see Figure A-2).

b. Standard dimensions for the 6.2 meter class ocean container, A-20, are shown in Figure A-2.

A.1.3 AIR FREIGHT CONTAINERS

There are as many sizes and variations of air containers as there are aircraft, and each size is designed to fit the contour of a particular airframe. Therefore, it is not practical to list sizes; refer to published aircraft loading charts for loading/size limits.

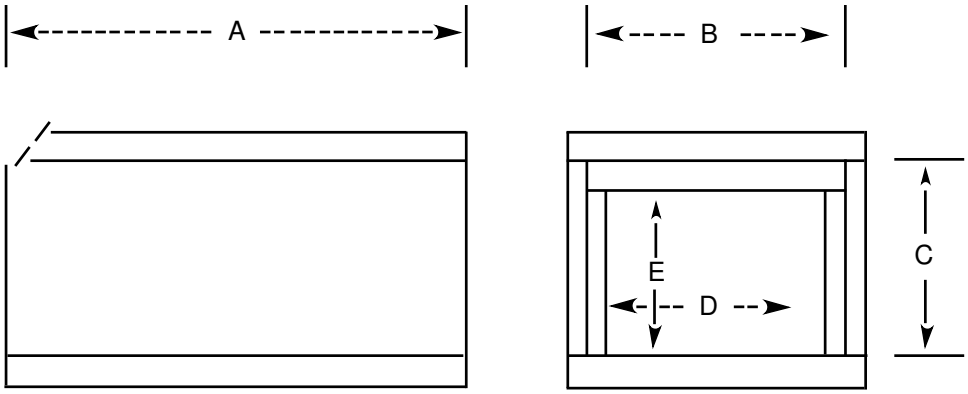
Figure A–1: Over-the-Road Vehicle Dimensions



TRUCK AND VAN DIMENSIONS							
Dim	Description	Common Carrier cm	Common Carrier in	Air Ride cm	Air Ride in	King Sz Air Ride cm	King Sz Air Ride in
A	Inside length	1185	(474)	1180	(472)	1365	(546)
B	Step height	NA		259	(103.5)	262.5	(105)
* C	Step depth	NA		315	(126)	270	(108)
D	Inside width	230	(92)	230	(92)	230	(92)
E	Inside height	240	(96)	279	(111.5)	305	(122)
F	Door height	227.5	(91)	227.5	(91)	277.5	(111)
G	Door width	225	(90)	225	(90)	225	(90)

* Vans only

Figure A–2: Ocean Container Dimensions



OCEAN CONTAINER DIMENSIONS					
Ocean Container Type	INTERIOR			DOOR OPENING	
	A Length	B Width	C Height	D Width	E Height
A–40 Standard Dry Cargo	1187.5 cm (475 in)	231 (92.5)	236 (94.4)	225 (90)	228 (91.1)
B–40 Hi–Cube Dry Cargo	1187.5 (475)	231 (92.5)	265 (106)	225 (90)	256 (102.5)
A–20 Standard Dry Cargo	237 (592)	231 (92.5)	236 (94.4)	225 (90)	228 (91.1)

A.2 MECHANICAL HANDLING

Whenever possible, Digital products shall be palletized to facilitate handling by mechanical means. The use of proper mechanical handling devices can greatly reduce the risk of damage to the product and packaging throughout the distribution process.

A.2.1 Mechanical Handling Devices

The primary vehicles used to move pallet loads of product in the Digital distribution system are fork trucks and pallet jacks (hand pallet trucks). There are a number of variations but the critical dimensions are common. Table A-1 contains a description of certain fork truck types and their dimensions. Table A-2 is a listing of hand pallet trucks and their dimensions. Figure A-3 illustrates the blade dimensions for hand pallet trucks and fork trucks.

Table A–1: Fork Truck Types and Dimensions

	Approximate Blade Dimensions (refer to Figure A-3) Measurements in centimeters (inches)			
Truck Capacity in kilograms (pounds) **	* A	* B	* C	* D
Up to 1136 (2500)	20 to 82.5 (8 to 33)	60 to 120 (4 to 48)	10 (4)	2.5 to 3.3 (1 to 1.31)
1364 to 2273 (3000 to 5000)	25 to 100 (10 to 39.5)	60 to 120 (24 to 48)	12.5 (5)	3.8 to 4.4 (1.5 to 1.75)
2273 to 2727 (5000 to 6000)	40 to 114 (16 to 45.5)	60 to 120 (24 to 48)	15 (6)	5.0 to 5.3 (2 to 2.13)
2727 to 4545 (6000 - 10000)	45 to 128 (18 to 55.5)	60 to 120 (24 to 48)	20 (8)	5.6 (2.25)

* Dimensions shown are approximate and may vary with different makes and models of equipment. All dimensions shown are in centimeters (inches).

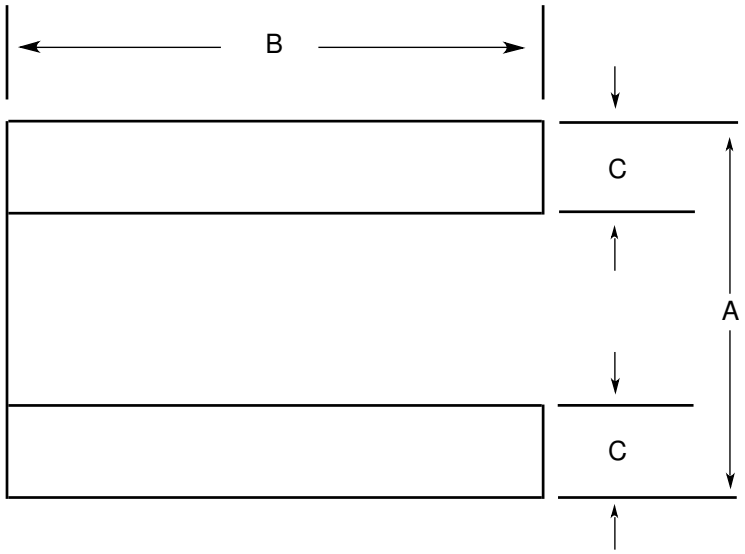
A = Outside of blade edges
B = Overall length of blades
C = Width of single blade
D = Floor to top surface of blade - minimum

** Usually at 60 cm (24 inch) load center. However, some models are rated at 37.5 cm (15 inch) load center.

Table A–2: Hand Pallet Trucks and Dimensions

Measurement (Figure A-3)	Approximate Range of Blade Dimensions in cm (inches)	Most Common Dimensions cm (inches)
A (outside of blade edges)	60 (24), 67.5 (27), 75 (30), 90 (36)	67.5 (27)
B (overall length of blades)	75 (30), 91 (36), 105 (42), 120 (48), 137 (54), 152 (60)	91 (36) 105 (42)
C (width of single blade)	15.0 (6), 21.3 (8.5), 22.5 (9) 23.7 (9.25)	22.5 (9)
D (floor to top surface of blade)	8.13 (3.25), 7.8 (3.13), 8.45 (3.38)	8.13 (3.25)

Figure A–3: Blade Dimensions for Hand Pallet Trucks and Fork Trucks



APPENDIX B REFERENCED DOCUMENTS

B.1 EL-Class Digital Documents

EL-Class Number	Document Title
EL-00043-00	*DEC STD 043-0 Packaging Requirements for Digital Products, Parts, Assemblies, and Materials*
EL-00045-00	*DEC STD 045-0 Packaging Products for International Shipment - Introduction*
EL-00064-00	*DEC STD 064-0 Compliance with International Language Requirements*
EL-00102-02	*DEC STD 102-2 Environmental Standard for Computers and Peripherals - Mechanical Shock and Vibration Test Requirements*
EL-00178-04	*DEC STD 178-4 Shipping Container Marking Requirements for Finished Goods*
EL-00178-05	*DEC STD 178-5 Marking Symbology*
EL-00178-08	*DEC STD 178-8 General Shipping Documentation and Container Labeling Requirements for Finished Goods Intended to be Shipped to Customers*
EL-MF425-00	*Procedures for Consolidating Packaged Products for Domestic and/or International Shipment*

Use VTX SMC to order copies of EL-class documents from Standards and Methods Control. Send distribution questions to JOKUR::SMC or call DTN: 234-4423.

B.2 Other Digital Documents

Document Number	Document Title
A-PS-3622283-01	*Desiccant Label*
A-PS-9900045-GS	*General Specification for Standard Packaging Artwork*

B.3 Other Documents

Document Number	Document Title
MIL-B-131	*Water/Vaporproof Barrier Material*
PPP-B-601	*U.S. Federal Specification - Boxes, Wood, Cleated-Plywood*
PPP-B-636	*U.S. Federal Specification - Fiberboard*
PPP-B-640	*U.S. Federal Specification - Boxes, Fiberboard, Corrugated, Triple-wall*

B.4 Ordering Information

Following are the sources for documents not available from Standards and Methods Control.

- Central Specification Control Systems
  (NRO-5/M2), any Microfilm Reference File, (35 mm aperture card) or the SPOC System

- Military and Federal Documents
  Copies of Federal Standards and Military Standards and Specifications are available from the Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 191220.

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